PATENT ABSTRACTS OF JAPAN

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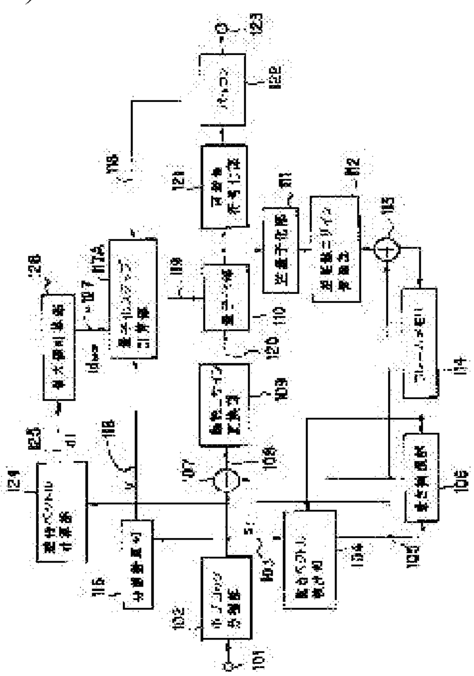
(54) INTER MOTION COMPENSATED FRAME CODING METHOD



(57)Abstract:
PURPOSE: To make degradation inconspicuous in an area where movement is uniform.
CONSTITUTION: A difference vector calculation part 124 calculates the sizes 125 of the difference vectors of the motion vector 105 of a coding object small block and the motion vectors of the eight adjacent small blocks. A maximum value calculation part 126 obtains a maximum value 121 among the sizes 125 of the eight difference vectors and sends it to a quantization step calculation part 117A. The quantization step calculation part 117A sets coarse quantization steps when intra-frame dipersion 116 is large, finely sets the quantization steps for a part where the intra-frame dispersion 116 is small, sets the coarse quantization steps when the maximum value 127 of the difference vector is large and finely sets the quantization steps for the part where the maximum value 127 is small under an allocated code amount based on the intra-frame dispersion 116, the maximum value 121 of the sizes of the difference vectors and a butter memory occupancy amount 118.

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the motion compensation interframe coding approach of digital image signals, such as a television signal.
[0002]
[Description of the Prior Art] It is known that it is not conspicuous even if it will take lessons for the flat field with little change from an eye as human being's vision property if degradation occurs, and some fields where change is sharp deteriorate (masking effect). From this, the field which coding noise tends to detect is quantized by the fine quantization step on the occasion of high efficiency coding of picture signals, such as a television signal, and the approach of quantizing the field which coding noise cannot detect easily by the coarse quantization step is used well.
[0003] Drawing 4 is the block diagram of conventional picture signal coding equipment. The case where a motion compensation and a discrete cosine transform standard as an image coding method are used is assumed.
[0004] First, the image inputted from the input terminal 101 is divided into the small block of NxN in the small block division section 102. After the motion vector 105 was called for in the picture signal lost-motion vector detecting element 104 before [one] being stored in the picture signal 103 and frame memory 114 of a small block, a motion compensation is performed in the motion compensation section 106 based on this motion vector 105 and the motion compensation prediction error signal 108 is searched for with a subtractor 107, a discrete cosine transform is performed in the discrete cosine transform section 109 to the motion compensation prediction error signal 108.
[0005] On the other hand, the frame internal variance 116 is called for by count of a degree type (1) in the distributed count section 115 from the picture signal 103 by which small block division was carried out, and it is sent to the quantization step count section 117.
[0006]
[Equation 1]

In the quantization step count section 117, it is the basis of fixed information, based on the frame internal variance 116 and the buffer memory occupation 118, when the frame internal variance 116 is large, a coarse quantization step is set up, and the processing which sets up a small part finely is made. After the discrete cosine transform multiplier 120 is quantized in the quantization section 110 using the set-up

quantization step 119 and variable length coding is carried out in the variable-length-coding section 121, it is inputted into buffer memory 122 and outputted to the coded data output terminal 123 with a fixed bit rate.
[0007] Moreover, after the reverse discrete cosine transform of the quantized discrete cosine transform multiplier is carried out in reverse quantization and the reverse discrete cosine transform section 112 by the reverse quantization section 111, it is added with the data and the adder 113 of a front frame by which the motion compensation was carried out, and is stored in a frame memory 114 for motion compensation prediction of degree frame.
[0008] According to such an approach, since it is fine and the intense part of change can quantize a flat part coarsely, it can become possible to distribute the limited amount of information appropriately according to a vision property, and the image quality of a coded image can be raised as a result.
[0009]
[Problem(s) to be Solved by the Invention] The case where the spatial description is equal and the conventional approach mentioned above is applied to the field (drawing 5 (a)) where a motion is uniform, and the field (drawing 5 (b)) where a motion is random like drawing 5 is considered. Since the spatial description of both fields is equal, the fineness of quantization becomes equal. However, compared with the field where a motion is random, degradation tends to be conspicuous for the way of the field where a motion is uniform. In such a case, according to the conventional approach, although it was thought appropriate that a motion made the quantization step of a uniform field fine compared with the field where a motion is random, since quantized control was performed only in the spatial description regardless of the difference in the vision property by motion, the quantization step of the field where a motion is uniform had the problem that it did not become fine.
[0010] The purpose of this invention is to offer the motion compensation interframe coding approach that a motion cannot be noticeable degradation and can carry out [degradation] in a uniform field.
[0011]
[Means for Solving the Problem] the motion compensation interframe coding approach of claim 1 of this invention -- the difference of the motion vector of the smallness block for coding, and the motion vector of a small block of the near -- the magnitude of a vector -- asking -- said difference -- a quantization step fine when the value of the magnitude of a vector is small -- setting up -- said difference -- when the value of the magnitude of a vector is large, a coarse quantization step is set up.
[0012] The motion compensation interframe coding approach of claim 2 of this invention asks for the include angle of the motion vector of the smallness block for coding, and the motion vector of a small block of the near to make, when the value of said include angle is small, it sets up a fine quantization step, and when the value of said include angle is large, it sets up a coarse quantization step.
[0013]
[Function] First, this invention is the motion vector [0014] of the smallness block for coding (slash section), as shown in drawing 3 (a) and (b).
[External Character 1]

The motion vector of the near smallness block [0015]
[External Character 2]

difference -- a vector [0016]
[External Character 3]

They are |di| or a motion vector [0017] in ** size.
[External Character 4]

It asks for ****** include-angle thetai (i=1-8). here -- difference -- magnitude-of-a-vector |di| and include-angle thetai can be expressed like a degree type (2).
[0018]
[Equation 2]

next, the difference between the called-for motion vectors -- magnitude-of-a-vector |di | or include-angle thetai ******** -- when those values are small, it judges that a uniform motion is shown, quantizes finely, it judges that a motion random when large is shown, and quantizes coarsely.
[0019] According to the approach which was described above, finer quantization is performed to the field where a motion is uniform, and coarser quantization is performed to the field where a motion is random.
[0020]
[Example] Next, the example of this invention is explained with reference to a drawing.
[0021] Drawing 1 is the block diagram of the picture signal coding equipment of the 1st example of this invention.
[0022] difference with the motion vector of the motion vector and about eight small block of the smallness block for coding in this example -- it uses as characteristic quantity showing the uniformity of a motion of the maximum of the magnitude of a vector, and this is used together with the frame internal variance of an object smallness block. The case where a motion compensation discrete cosine transform is used as an image coding method is assumed.
[0023] the motion vector 105 to which this example was able to be found in the motion vector detecting element 104 to the conventional equipment of drawing 4 -- receiving -- the difference of the motion vector 105 and the motion vector of about eight small block of the smallness block for coding -- the difference which calculates the magnitude of a vector 125 -- the calculus-of-vectors section 124 and eight difference -- the maximum 127 of the magnitude of a vector 125 is calculated, and the maximum count section 126 sent to quantization step count section 117A is added.
[0024] Next, actuation of this example is explained.
[0025] First, the image inputted from the input terminal 101 is divided into the small block of NxN in the small block division section 102. After the motion vector 105 was called for in the image lost-motion vector detecting element 104 before [one] being stored in the picture signal 103 and frame memory 114 of a small block, a motion compensation is performed in the motion compensation section 106 based on this motion vector 105 and the motion compensation prediction error signal 108 is searched for with a subtractor 107, a discrete cosine transform is performed in the discrete cosine transform section 112 to the motion compensation prediction error

signal 108.
[0026] On the other hand, the frame internal variance 116 is called for by count of a formula (1) in the distributed count section 115 from the picture signal 103 by which small block division was carried out, and it is sent to quantization step count section 117A. moreover, the motion vector 105 which was able to be found in the motion vector detecting element 104 -- receiving -- difference -- the calculus-of-vectors section 124 -- setting -- the difference of the motion vector 105 and the motion vector of about eight small block of the smallness block for coding -- the magnitude of a vector 125 is calculated. next, the maximum count section 126 -- setting -- eight difference -- the maximum 127 (|d|max) of the magnitude of a vector 125 is calculated by the degree type (3), and is sent to quantization step count section 117A.
[0027]
[Equation 3]

quantization step count section 117A -- setting -- the frame internal variance 116 and difference -- the processing which is the basis of the amount of signs assigned based on the maximum 127 and the buffer memory occupation 118 of the magnitude of a vector, sets up a coarse quantization step when the frame internal variance 116 is large, and sets up a small part finely, and difference -- when the maximum 127 of the magnitude of a vector is large, a coarse quantization step is set up, and the processing which sets up a small part finely is made. After the discrete cosine transform multiplier 120 is quantized in the quantization section 110 using the set-up quantization step 119 and variable length coding is carried out in the variable-length-coding section 121, it is inputted into buffer memory 122 and outputted to the coded data output terminal 123 with a fixed bit rate.
[0028] Moreover, after the reverse discrete cosine transform of the quantized discrete cosine transform multiplier is carried out in reverse quantization and the reverse discrete cosine transform section 112 by the reverse quantization section 111, it is added with the data and the adder 113 of a front frame by which the motion compensation was carried out, and is stored in a frame memory 114 for motion compensation prediction of degree frame.
[0029] Drawing 2 is the block diagram of the picture signal coding equipment of the 2nd example of this invention.
[0030] In this example, it uses as characteristic quantity showing the uniformity of a motion of the maximum of the include angles of the motion vector and the motion vector of about eight small block of the smallness block for coding to make, and this is used together with the frame internal variance of an object smallness block. The case where a motion compensation discrete cosine transform is used as the image coding approach is assumed.
[0031] This example calculates the maximum 131 of the include angles 129 which the include-angle count section 128 which calculates the include angle 129 of the motion vector 105 and the motion vector of about eight small block of the smallness block for coding to make to the conventional equipment of drawing 4 to the motion vector 105 which was able to be found in the motion vector detecting element 104, and eight motion vectors make, and the maximum count section 130 sent to quantization step count section 117A is added.
[0032] Next, actuation of this example is explained.
[0033] First, the image inputted from the input terminal 101 is divided into the small block of NxN in the small block division section 102. After the motion vector 105

was called for in the image lost-motion vector detecting element 104 before [one] being stored in the picture signal 103 and frame memory 114 of a small block, a motion compensation is performed in the motion compensation section 106 based on this motion vector 105 and the motion compensation prediction error signal 108 is searched for with a subtractor 107, a discrete cosine transform is performed in the discrete cosine transform section 109 to the motion compensation prediction error signal 108.
[0034] On the other hand, the frame internal variance 116 is called for by count of a formula (1) in the distributed count section 115 from the picture signal 103 by which small block division was carried out, and it is sent to quantization step count section 117B. Moreover, in the include-angle count section 128, the include angle 129 of the motion vector 105 and the motion vector of about eight small block of the smallness block for coding to make is calculated to the motion vector 105 which was able to be found in the motion vector detecting element 104. Next, in the maximum count section 130, the maximum 131 (thetamax) of the include angles 129 which eight motion vectors make is calculated by the degree type (4), and is sent to quantization step count section 117B.
[0035]
[Equation 4]

It is the basis of the amount of signs assigned in quantization step count section 117B based on the maximum 131 and the buffer memory occupation 118 of an include angle 129 of the frame internal variance 116 and the motion vector of the near smallness block to make. A quantization step coarse when the frame internal variance 116 is large is set up. When a small part has the large maximum 131 of the processing set up finely and the include angle 129 with the motion vector of the near smallness block to make, a coarse quantization step is set up, and the processing which sets up a small part finely is made. After the discrete cosine transform multiplier 120 is quantized in the quantization section 110 using the set-up quantization step 119 and variable length coding is carried out in the variable-length-coding section 121, it is inputted into buffer memory 122 and outputted to the coded data output terminal 123 with a fixed bit rate.
[0036] Moreover, after the reverse discrete cosine transform of the quantized discrete cosine transform multiplier is carried out in reverse quantization and the reverse discrete cosine transform section 112 by the reverse quantization section 111, it is added with the data and the adder 113 of a front frame by which the motion compensation was carried out, and is stored in a frame memory 114 for motion compensation prediction of degree frame.
[0037] the example described above -- respectively -- difference -- although aimed at the configuration used together with distribution of the picture signal for coding using the maximum of the magnitude of a vector, and the maximum of the include angle which a motion vector makes, statistics other than maximum (average, distribution, etc.) can also be used. Moreover, it is also possible to use together with other characteristic quantity and to perform quantized control.
[0038]
[Effect of the Invention] it explained above -- as -- this invention -- the difference of the motion vector of the smallness block for coding, and the motion vector of a small block of the near -- it is not conspicuous, degradation can carry out by performing fine quantization in a field with the uniform motion in which degradation tends to be

conspicuous to the description of a local motion of a picture signal based on the magnitude of a vector and/or an include angle, and amount of information can reduce by performing quantization coarse in the random field in which degradation is not conspicuous. Moreover, it is effective as a means which can also raise effectiveness further according to concomitant use with other characteristic quantity, such as distribution of the picture signal for coding, and raises image quality under fixed amount of information as a result. Reduction of visual degradation can be performed.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram of the picture signal coding equipment of the 1st example of this invention.
[Drawing 2] It is the block diagram of the picture signal coding equipment of the 2nd example of this invention.
[Drawing 3] difference -- it is drawing showing how to ask for the include angle which a vector and a motion vector make.
[Drawing 4] It is the block diagram of the conventional example of picture signal coding equipment.
[Drawing 5] It is drawing showing the example of a field with a uniform motion, and a field with a random motion.
[Description of Notations]
101 Input Terminal
102 Small Block Division Section
103 Small Block Picture Signal
104 Motion Vector Detecting Element
105 Motion Vector
106 Motion Compensation Section
107 Subtractor
108 Motion Compensation Prediction Error Signal
109 Discrete Cosine Transform Section
110 Quantization Section
111 Reverse Quantization Section
112 Reverse Discrete Cosine Transform Section
113 Adder
114 Frame Memory
115 Distributed Count Section
116 Frame Internal Variance
117A, 117B Quantization step count section
118 Buffer Memory Occupation
119 Quantization Step
120 Discrete Cosine Transform Multiplier
121 Variable-Length-Coding Section
122 Buffer Memory
123 Output Terminal
124 Difference -- Calculus-of-Vectors Section
125 Difference -- Magnitude of a Vector
126 Maximum Count Section

127 Difference -- Maximum of Magnitude of a Vector
128 Include-Angle Count Section
129 Include Angle Which Motion Vector Makes
130 Maximum Count Section
131 Maximum of Include Angle Which Motion Vector Makes

CLAIMS

[Claim 1] the motion compensation interframe coding approach -- setting -- the difference of the motion vector of the smallness block for coding, and the motion vector of a small block of the near -- the magnitude of a vector -- asking -- said difference -- a quantization step fine when the value of the magnitude of a vector is small -- setting up -- said difference -- the motion compensation interframe coding approach characterized by setting up a quantization step coarse when the value of the magnitude of a vector is large.

[Claim 2] It is the motion compensation interframe coding approach characterized by asking for the include angle of the motion vector of the smallness block for coding, and the motion vector of a small block of the near to make, setting up a fine quantization step in the motion compensation interframe coding approach when the value of said include angle is small, and setting up a quantization step coarse when the value of said include angle is large.

[Claim 3] It asks for the magnitude of a vector. the motion compensation interframe coding approach -- setting -- the difference of the motion vector of the smallness block for coding, and the motion vector of a small block of the near -- It asks for the include angle of the motion vector of the smallness block for coding, and the motion vector of a small block of the near to make. said difference -- a quantization step fine when the value of the magnitude of a vector and/or said include angle is small -- setting up -- said difference -- the motion compensation interframe coding approach characterized by setting up a quantization step coarse when the value of the magnitude of a vector and/or said include angle is large.

[Claim 4] the called-for difference -- the approach of three given in any 1 term from claim 1 which uses the maximum of the magnitude of a vector, and the maximum of the called-for include angle in the case of a setup of a quantization step.

[Claim 5] the called-for difference -- the approach of three given in any 1 term from claim 1 used in the case of a setup of the average of the magnitude of a vector, and the average of the called-for include angle of a quantization step.

[Claim 6] the called-for difference -- the approach of three given in any 1 term from claim 1 used in the case of a setup of distribution of the magnitude of a vector, and the called-for distribution of an include angle of a quantization step.

[Claim 7] The approach of six given in any 1 term from claim 1 which uses together with distribution of the picture signal for coding, and sets up a quantization step.